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19 ABSTRACT (Continue on reverse if necessary and identify by block number)

This program provides an intense training environment with hands-on experience in molecular approaches to marine biology. Twenty-one students were enrolled in the program in 1988 and sixteen students received ONR support. Areas covered in 1988 included (1) physiology/molecular biology of algae and (2) cell biology of early embryonic development. These two courses will also be offered in 1989 and in addition there will be a course in Video Microscopy and Image Processing. The exposure of students in this intense environment will result in the participants developing new approaches to answer classic problems of marine biology.

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S/N 0102-LF-014-6603

Progress Report on Contract N00014-88-K-0325

Principal Investigators: Daniel Mazia
David Epel

Contractor: Stanford University

Contract Title: Instruction at the Hopkins Marine Station

Start Date: April 1, 1988 (Year 1)
April 1, 1989 (Year 2)

PROGRAM OBJECTIVES:

Exposure of students/young investigators to problems/opportunities in marine biology, emphasizing new cellular and molecular approaches to classical marine biological questions.

PROGRESS (YEAR 1)

Two courses were offered in the summer of 1988, "The Ecophysiology and Molecular Biology of Macrophytes" and "The Cell Biology of Early Development." We were not able to offer the course in "Video Microscopy and Image Processing" because of problems in assembling a knowledgeable staff for this relatively new field.

The students enrolled in these courses come from highly diverse backgrounds. All classes had students at the graduate, post-doctoral and faculty level as well as a small number of undergraduates. The students come from universities throughout the US, and also from abroad (e.g., United Kingdom, Japan, Portugal).

Training in the courses is intense and this total immersion in subject matter is an important part of the program's success. Classes involve in-depth lectures, often by visiting specialists, with ample time (and encouragement) for questions and discussion. The lectures complement an

active laboratory experience which exposes students to the current body of knowledge in each field and perhaps more importantly the outstanding problems in each discipline. At the end of three or four weeks of lecture/lab experience, the students design a research project which they then complete over the next one-two weeks; they then report on these projects in a day-long symposium. The course schedules for 1988 are attached as well as a listing of papers presented at the symposia (note that some of the papers presented in this symposia are from an ecology course not sponsored by the ONR).

The individual research projects culminate this intense summer experience. As examples of the scope of the projects, the Cell Biology of Early Development class included studies on (1) electropermeabilization, a new tool for introducing impermeant molecules into cells, along with other studies on micro-injection, (2) effects of high hydrostatic pressure on embryos, (3) scanning electron micrograph studies and (4) effects on ultraviolet radiation. The Ecophysiology and Molecular Biology of Macrophytes course examined areas ranging from the ecological-physiological interface - such as the effects of osmotic stress and flow rates on on photosynthesis - to physiological studies on nitrogen assimilation and photo-inhibition of this important process.

WORK PLAN (YEAR 2)

We have modified the approach and content of last years' courses and added a course in "Video Microscopy and Image Processing". The "Cell Biology of Early Development" course will bring three guest instructors for one-week periods, beginning with a one-week intensive introduction to patterns of development and larval metamorphosis. This will be followed by a week on fertilization/chemotaxis and one week on mitosis and cytokinesis,

emphasizing immunochemistry. The Image Processing course will introduce students to the technologies and instrumentation of this rapidly developing fields. The algal course will be upgrading its emphasis on molecular techniques as applied to marine algae.

As in the previous year, all courses will utilize numerous guest lecturers who are all leaders in their fields. Also as in past years, the courses will benefit from the loan of state-of-the-art equipment from various vendors (such as microscopes, confocal microscopes, micro-injectors, image processing equipment etc. etc.).

Training Activities: A list of students supported by the ONR grant for 1988 is appended. Also attached are a listing of lecture and research projects.

Research Activities: At least one of the class projects has been continued as an ongoing research program. Robert Lauzon, a post-doctoral fellow in Dr. Irving Weissman's lab and a student in the 1988 Cell Biology of Early Development course, has now shifted his work as a result of the course experience. His research has been selected for presentation at a symposium of the International Conference on Invertebrate Reproduction, to be held in Japan. A publication will be forthcoming.

The following students were awarded ONR-Advanced Training in Molecular Marine Biology Tuition Fellowships for the 1988 Summer Quarter:

	Amount	Course
Josef D. Ackerman (Cornell University)	$ 970.00	Marine Macrophytes
Linda A. Franklin (Duke University)	970.00	Marine Macrophytes
Mark W. Haffer (UC Davis)	970.00	Cell Biology
Navdeep S. Jaikaria (NY Medical College)	970.00	Cell Biology
Minas Kocamoglu (California State University Fullerton)	970.00	Cell Biology
Robert Lauzon (Stanford University Medical School)	970.00	Cell Biology
Sandy K.S. Luk (University of Manitoba)	970.00	Cell Biology
David Nagajski (University of Sussex)	970.00	Cell Biology
William J. Pavan (Johns Hopkins University School of Medicine)	970.00	Cell Biology
Clara A. Pinto Correia (Lisbon Medical School)	970.00	Cell Biology
Ellen M. Popodi (Marquette University)	970.00	Cell Biology
Gustavo R. Rosania (Stanford University)	1,719.00	Cell Biology
Stuart Slaven (Univ. of Arkansas for Medical Sciences)	1,719.00	Marine Macrophytes
Kristin F. Thomas (California State University Fullerton)	1,719.00	Cell Biology
Marie A. Vodicka (Amherst College)	970.00	Cell Biology

Harry Witchel (University of California Berkeley)	970.00	Cell Biology

CELL BIOLOGY OF EARLY DEVELOPMENT: THE CELL CYCLE

June 13-July 15, 1988
Hopkins Marine Station
David Epel, Daniel Mazia and Dominic Poccia, Instructors

Lectures will be in Agassiz 11, typically from 9:00 am to noon. Labs will begin ~1:00--1:30 pm (depending on when lecture is over). On days of field trips, the lecture will be later (time to be announced).

Week 1	June 13	Cell activation	D. Epel
	14	Cell activation	D. Epel
FIELD TRIP	15	Cell activation	D. Epel
		Cell permeabilization	Robert Swezey (HMS)
FIELD TRIP	16	Cell cycle	D. Mazia
	17	Cell cycle	D. Mazia
Week 2	June 20	Mitotic apparatus	D. Mazia
	21	Cytoskeleton/Cytokinesis	James Spudich(Stanford)
	22	Chromosome movement	Zacheus Cande (UCB)
	23	Mitotic chromosome condensation	D. Poccia/D. Mazia
	24	----------	
Week 3	June 27	Spermatogenesis/Pronuclear activation	D. Poccia
	28	Histones in the Cell Cycle	D. Poccia
	29	Ciliogenesis	Ellen Dirksen (UCLA)
	30	Cell Organization	Gerald Schatten(Wisc)
FIELD TRIP-July 1		Protein Phosphorylation in the Cell Cycle	Frank Suprynowicz (Scripps Clinic).
Week 4	July 4	----------	
	5	RESEARCH PROJECTS	
	6	" "	
	7	" "	
	8	" "	
Week 5	July 11	" "	
	12	" "	
	13	" "	
	14	" "	
	15	CLASS SYMPOSIUM	

Summer 1988 | ECOPHYSIOLOGY & CELL BIOLOGY OF MARINE MACROPHYTES | 142H

Date	Lecture Schedule	Lecturer
	WEEK I	
Mon. June 13	The Inter- and Subtidal Zones	C. Smith
	The Chlorophyta	C. Smith
Tues. June 14	The Rhodophyta	C. Smith
	The Rhodophyta	C. Smith
Wed. June 15	The Phaeophyta	C. Smith
	The Kelps	C. Smith
Thurs. June 16	Intertidal Transect	
	The Seagrasses	R. Alberte
2:30 p.m.	Monterey Bay Aquarium Tour	
Fri. June 17	More Intertidal Field Work	
11:00 a.m.	Optical Properties of the Water Column	R. Zimmerman
	Light Phenomena: Pigments and Photoreception	R. Alberte
	HOPKINS LECTURE	
4:00 p.m.	Women in Science	P. Penhale
Sat. June 18	Big Sur Field Trip (8:00 to ca. 2:00)	

WEEK II

Mon. June 20	Molecular Tools for Studying Adaptation	R. Alberte
	Marine Symbioses	L. Muscatine
Tues. June 21	Targeting and Cell Wall Synthesis	E. Gonzalez
	Pigment-Proteins & the Photosynthetic Unit	R. Alberte
Wed. June 22	Cell & Molecular Biology of Chloroplasts	R. Alberte
	Light Reactions in Photosynthesis	R. Alberte
Thurs. June 23	Applications of DNA Technologies to Algae	S. Fain
	Light Adaptation in Algae	R. Alberte
Fri. June 24	DNA Polymorphisms: Markers for Speciation	S. Fain
	Photosynthetic Carbon Metabolism	R. Alberte
evening	Research Project Discussions	
Sat. June 25	Ano Nuevo Field Trip (10:00 to ca. 3:00)	

WEEK III

Mon. June 27	Carbon Metabolism & Partitioning	R. Alberte
	Nutrient Dynamics in Algae	R. Zimmerman
Tues. June 28	Nitrogen Assimilation and Metabolism	R. Zimmerman
	Integration of Metabolism and Cell Processes	R. Alberte
Wed. June 29	Immunological Methods for Macrophytes	R. Alberte
	HOPKINS LECTURE	
4:00 p.m.	Molecular Approaches to Algal Phylogenies	R. Cattolico
Thurs. June 30	Stress in the Intertidal	C. Smith
	Salinity and Temperature Stress	C. Smith
Fri. July 1	Fluid Dynamics of the Inter- & Subtidal	M. Denny
	Parasitism in Red Algae	L. Goff
Sat. July 2-	Elkhorn Slough Field Trip (10:00 to ca. 3:00)	

WEEK IV

RESEARCH PROJECTS

Mon. July 4	Picnic	
Tues. July 5 4:00 p.m. Fisher Hall	VAN NIEL MEMORIAL LECTURE Silicon and Life: What the Diatom Can Tell Us	B. Volcani
Weds. July 6 (9:00 a.m.)	Environmental Control of The Cell Cycle	J. Smith
Thurs. July 7	Life in reducing Sediments	R. Smith

WEEK V

RESEARCH PROJECTS

Mon. July 11	Flow, Flapping and Photosynthesis: The Role of Undulate Blades	M. Koehl
July 14-15	Research Project Reports - HMS Annual Meeting	

LABORATORY SCHEDULE

WEEK I

Mon. Jun. 13	Laboratory - Green Algae
Tues. Jun 14	Laboratory - Red Algae
Weds. Jun 15	Laboratory - Brown Algae
Thurs. Jun 16	Field - Intertidal Transect, Data Analysis (Lotus)
Fri. Jun 17	Field - Intertidal Work, Data Discussions
	Pigment Analyses and Spectrophotometry
Sat. Jun 18	Field Trip to Big Sur

WEEK II

Mon. Jun 20	Oxygen Exchange Technologies/Spectrophotometry
Tues. Jun 21	Measurement of Reaction Centers, PSU sizes
Weds. Jun 22	Protoplast Isolation
Thurs. Jun 23	Isolation and Purification of DNA and RNA
Fri. Jun 24	DNA Restriction Mapping
Sat. Jun 25	Field Trip - Ana Nuevo

WEEK III

Mon. Jun 27	Nitrate Assimilation - Nitrate Reductase
Tues. Jun 28	Ammonium Assimilation - Glutamine Synthetase
Weds. Jun 29	Protein Isolation and Separations/Western Blotting
Thurs. Jun 30	In situ Immuno-localizations
Fri. Jul 1	Fluorescence Microscopy
Sat. Jul 2	Field Trip - Elkhorn Slough

WEEKS IV & V

Jul 5-13	RESEARCH PROJECTS
Jul 14-15	Research Project Presentations

C H I N A P O I N T A C A D E M Y O F S C I E N C E S

H O P K I N S M A R I N E S T A T I O N

F O U R T H A N N U A L

S U M M E R S E S S I O N R E S E A R C H S Y M P O S I U M

FRIDAY, JULY 15, 1988

FISHER HALL

Friday, July 15, 1988

8:50-9:00 Opening Remarks: David Epel

SESSION 1 Chairperson: Daniel Mazia

9:00-9:15	Bill Pavan	Electropermeabilization and introduction of inhibitors into sea urchin embryos.
9:15-9:30	Robert Padgett	Population explosion in the predatory intertidal gastropod, Ocenebra, and a study of its food resource.
9:30-9:45	John Ryan	The microhabitats of the predatory gastropod Ocenebra.
9:45-10:00	John Fowler	Pattern of distribution of the predatory gastropod Ocenebra circumtexta in the region of the population explosion.
10:00-10:15	David Nagajski	Hydrostatic pressure effects on sea urchin development
10:15-10:30	Emily Carrington	Thermal and osmotic stress in the intertidal red alga Mastocarpus papillatus.

10:30-10:45 COFFEE/TEA BREAK

SESSION 2 Chairperson: Celia Smith

10:45-11:00	Ellen Popodi & Marie Vodicka	Twinning of sand dollar embryos: thiols or heavy metal?
11:00-11:15	Heidi Dierssen	Inter- & intra- specific interactions among four carnivorous snail species.
11:15-11:30	Minas Kocamoglu	A new technique for microinjection of star fish oocytes.
11:30-11:45	Josef Ackerman	Photosynthetic responses of marine macrophytes to current flow.
11:45-12:00	Robert Lauzon & Debby Kajiyama	The role of microtubules in ooplasmic segregation in Ascidia ceratodes.

12:00-1:00 LUNCH BREAK

SESSION 3 — Chairperson: Lani West

1:00-1:15	John Reguzzoni	Partitioning of nitrogen assimilation in two populations of the eelgrass, *Zostera marina*.
1:15-1:30	Stuart Slavin	Nitrogen assimilation in two ecotypes of the giant kelp *Macrocystis pyrifera*.
1:30-1:45	John Kellogg	Light adaptation in *Macrocystis pyrifera*.
1:45-2:00	Mwenda Kudumu	Observations from the simulated natural habitats of predatory snails (*Nucella emarginata*, *Ocenebra circumtexta*, *Acanthina punctulata*, and *A. spirata*.
2:00-2:15	Sandy K. S. Luk	Microinjection of sperm into sea urchin eggs.
2:15-2:30	Lisa Martinez	Effect of diet history on newly emerged *Nucella emarginata*: growth and feeding rates.
2:30-2:45	Megan Smith	Feeding habits of hatchling *Nucella emarginata* and *Acanthina spp*.

2:45-3:00 COFFEE/TEA BREAK

SESSION 4 — Chairperson: Chuck Baxter

3:00-3:15	Linda Franklin	Effects of photoinhibition on red algal photosynthesis.
3:15-3:30	Mark Haffer	SEM observation on refertilization of sea urchin eggs.
3:30-3:45	Navdeep Jaikaria	Effect of aphidicolin on chromosomal replication and condensation.
3:45-4:00	Kris Thomas	The role of microtubules in polar body formation in *Urechis*.
4:00-4:15	Curtis Givan	Glycollate metabolism in Chlorophytes.
4:15-4:30	Gustavo Rosania	An interpretation of ultraviolet radiation-induced delay of mitosis.
4:30-4:45	Scott Morrison	Problems in studying behavioral ecology: Haul-out pattern and site fidelity of the harbor seal, *Phoca vitulina*.

4:45-5:00 Concluding Remarks: Randall Alberte